



PHOTO-BIOREACTOR DESIGN REVIEW

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PROBLEM DEFINITION

CREATE AN EFFICIENT AIRLIFT PHOTO-BIOREACTOR TO
BRING BIOFUEL RESEARCH A STEP FORWARD AT THE
UNIVERSITY OF IDAHO

PHOTO-BIOREACTOR REACTOR

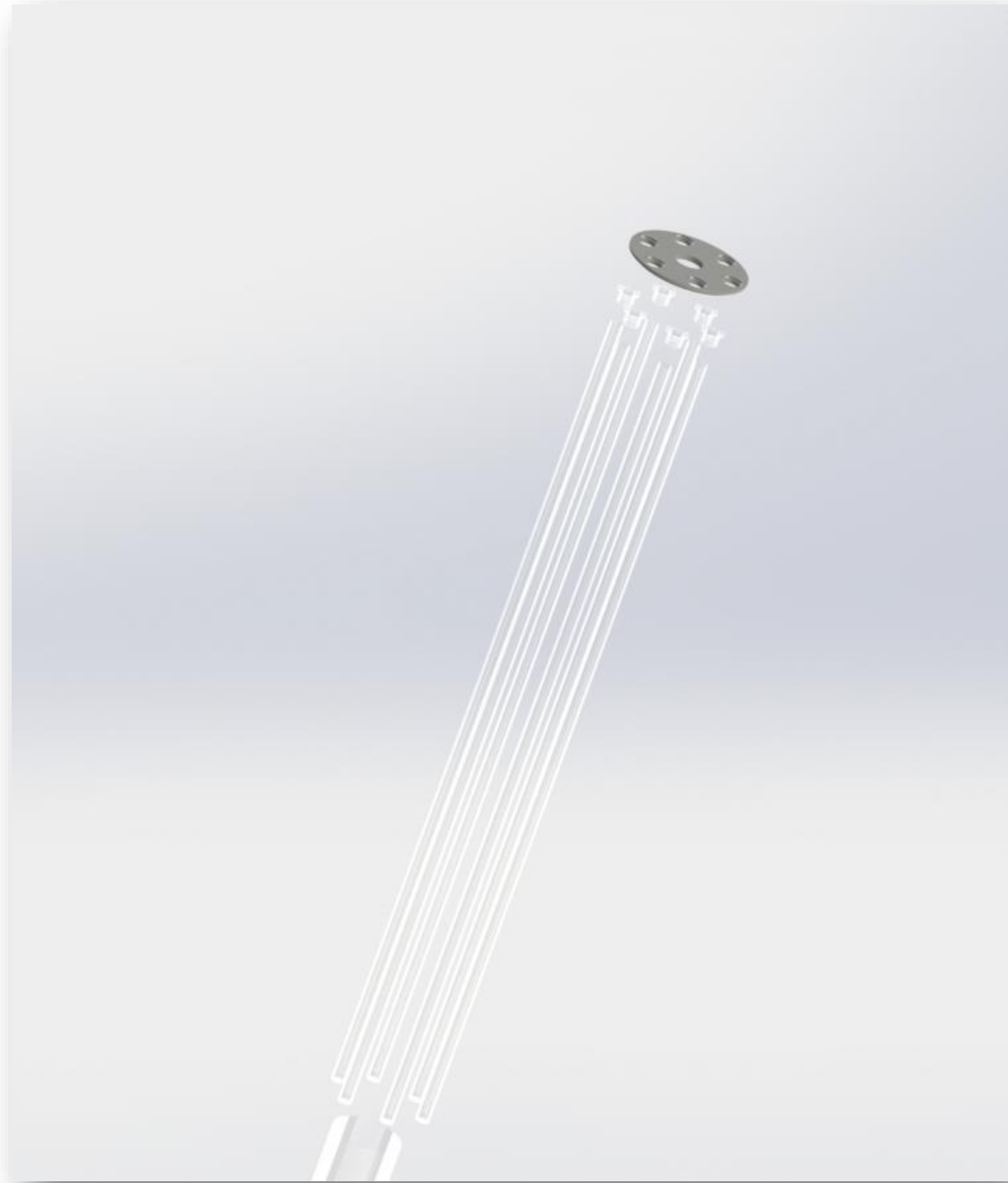
LUKE BECIA, SAGE PRATT, SAMUEL FUNK, MATTHEW
JUNGERT, NATHAN WIEDENMEYER

MAIN COMPONENTS

- Lid
 - Lid cover
 - Light tube covers
 - Instruments
- Body
 - 6 light tubes
 - Flange at bottom
- Base
 - Machine Contoured
 - Aluminum attachment plate
 - Bolts and fittings
 - Frame

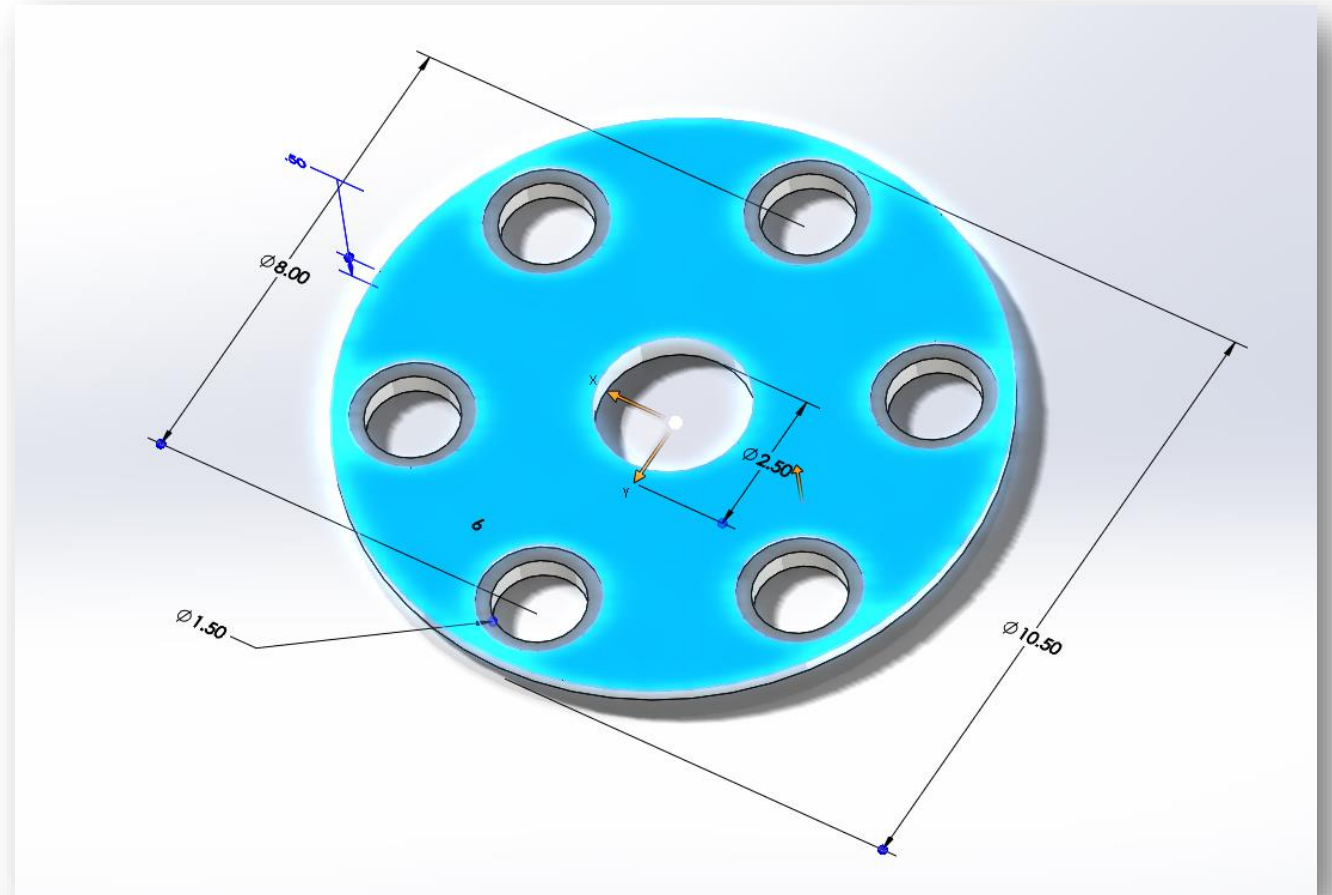
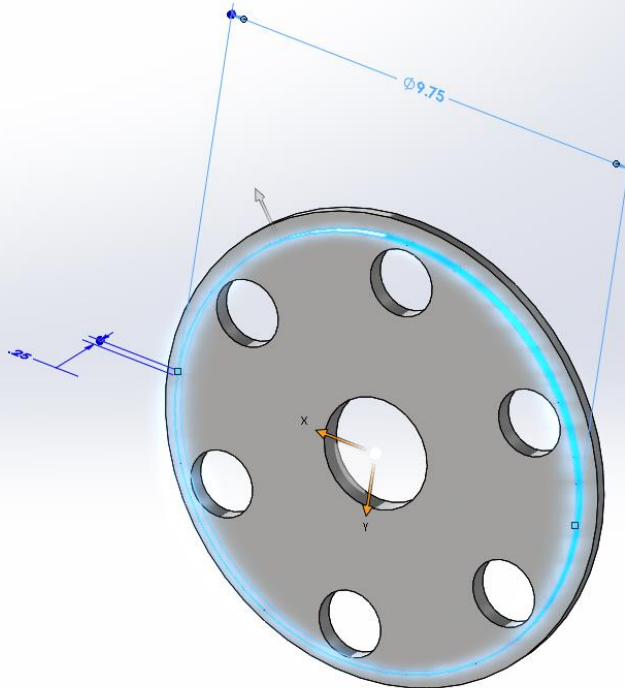


LID



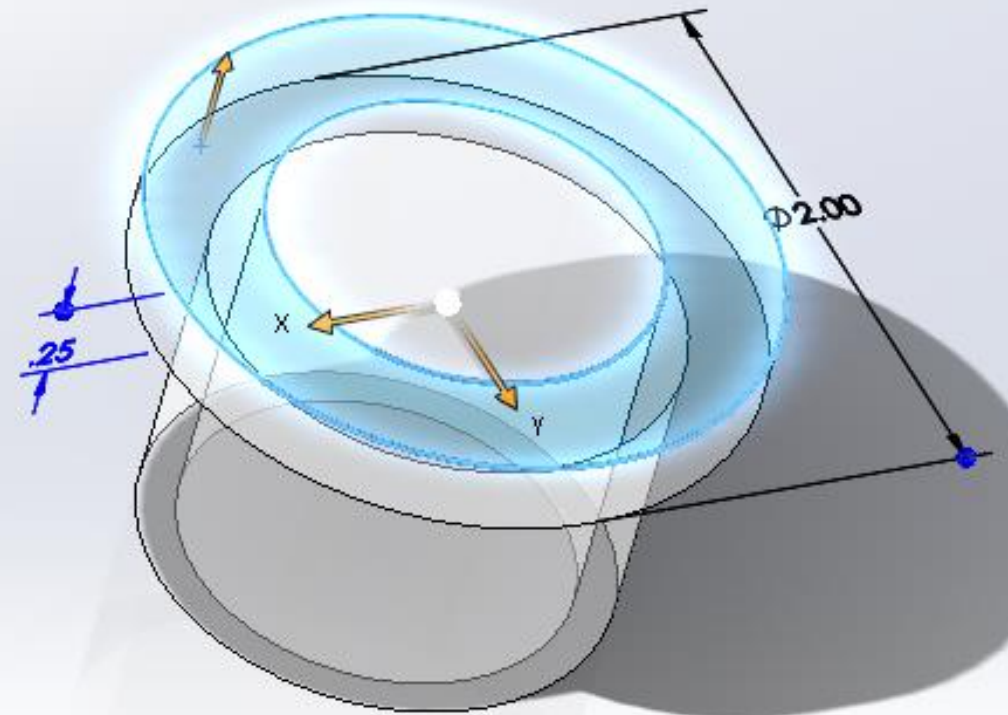
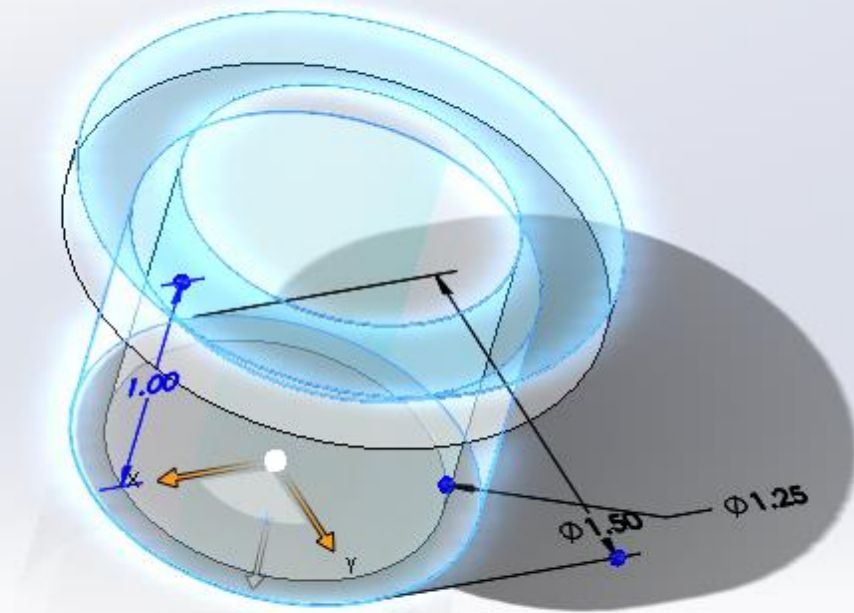
LID

- Cut Out for Mounting
- Step Cut Holes for Light Tubes
- Center Hole for Gas Outlet (or for Plug)
- Made From Stock in Shop



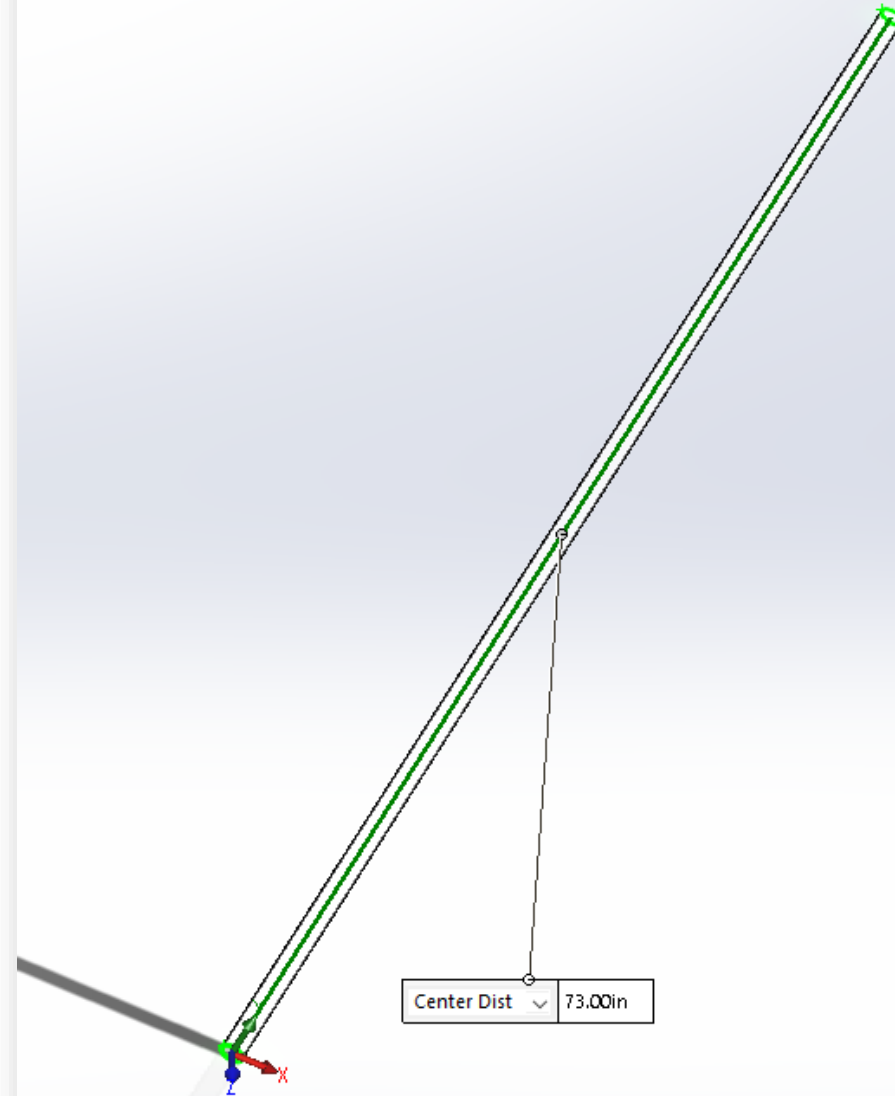
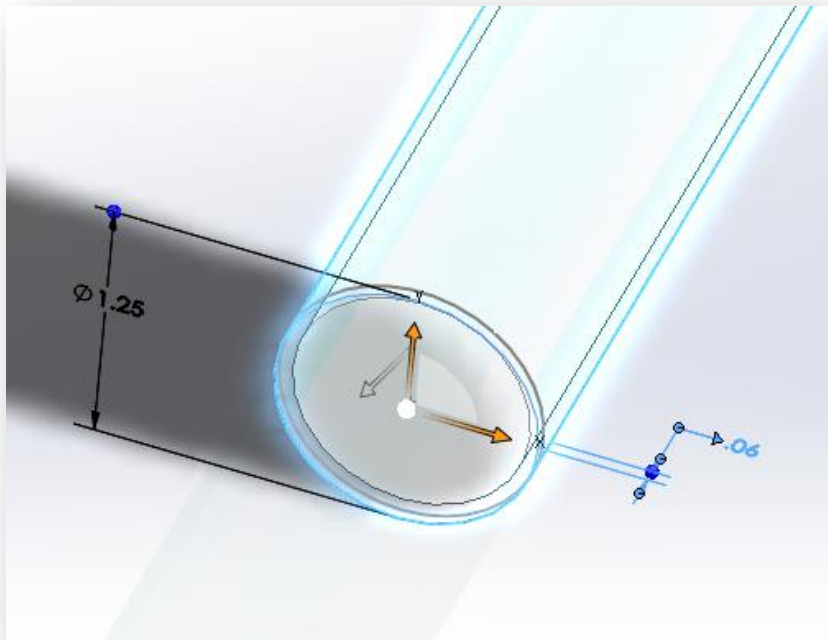
LID

- Light Tube Connectors
- Made From Stock in Shop



LID

- Six 1.25" Light Tubes
- Flat Caps at the Bottom
- Six Feet Long
- Purchased Online

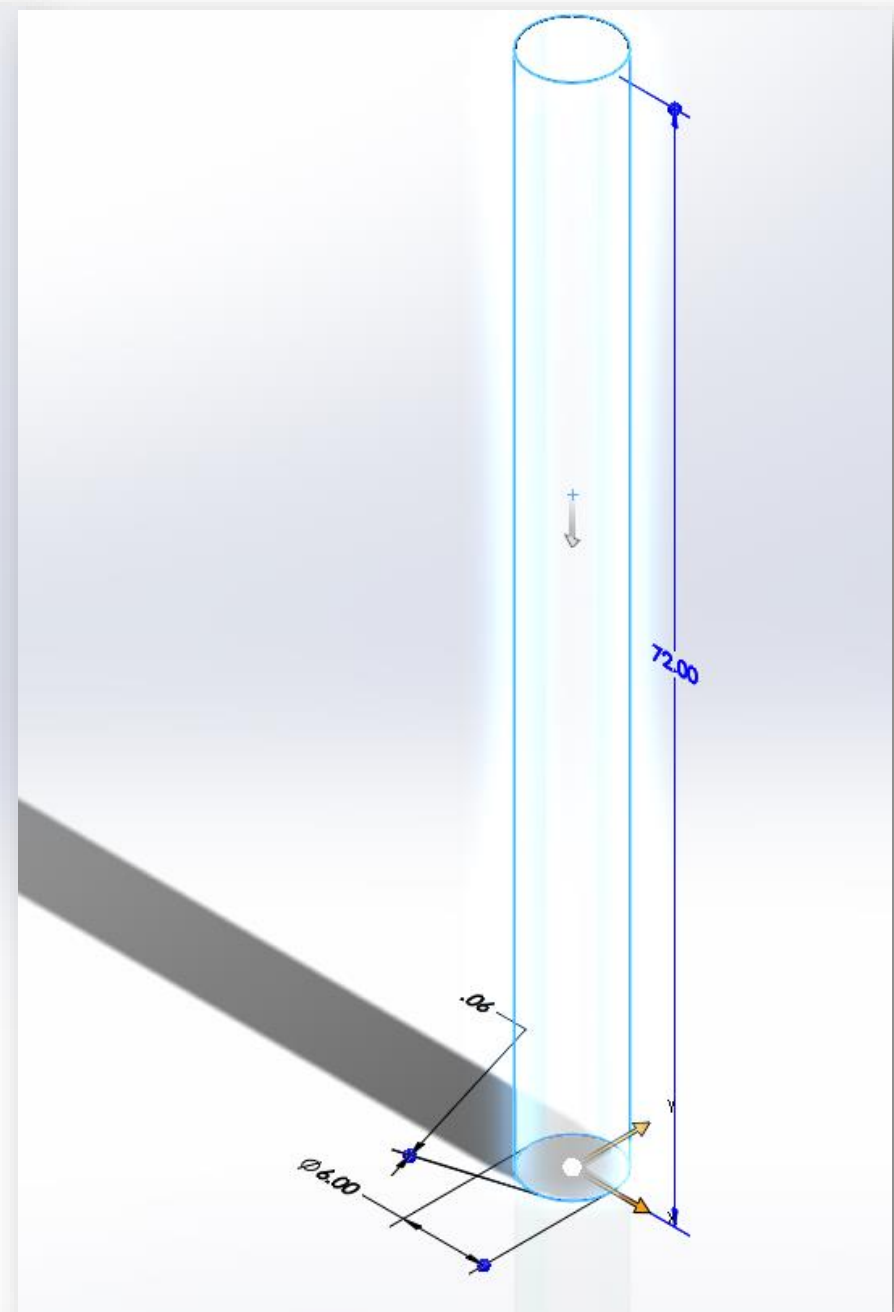
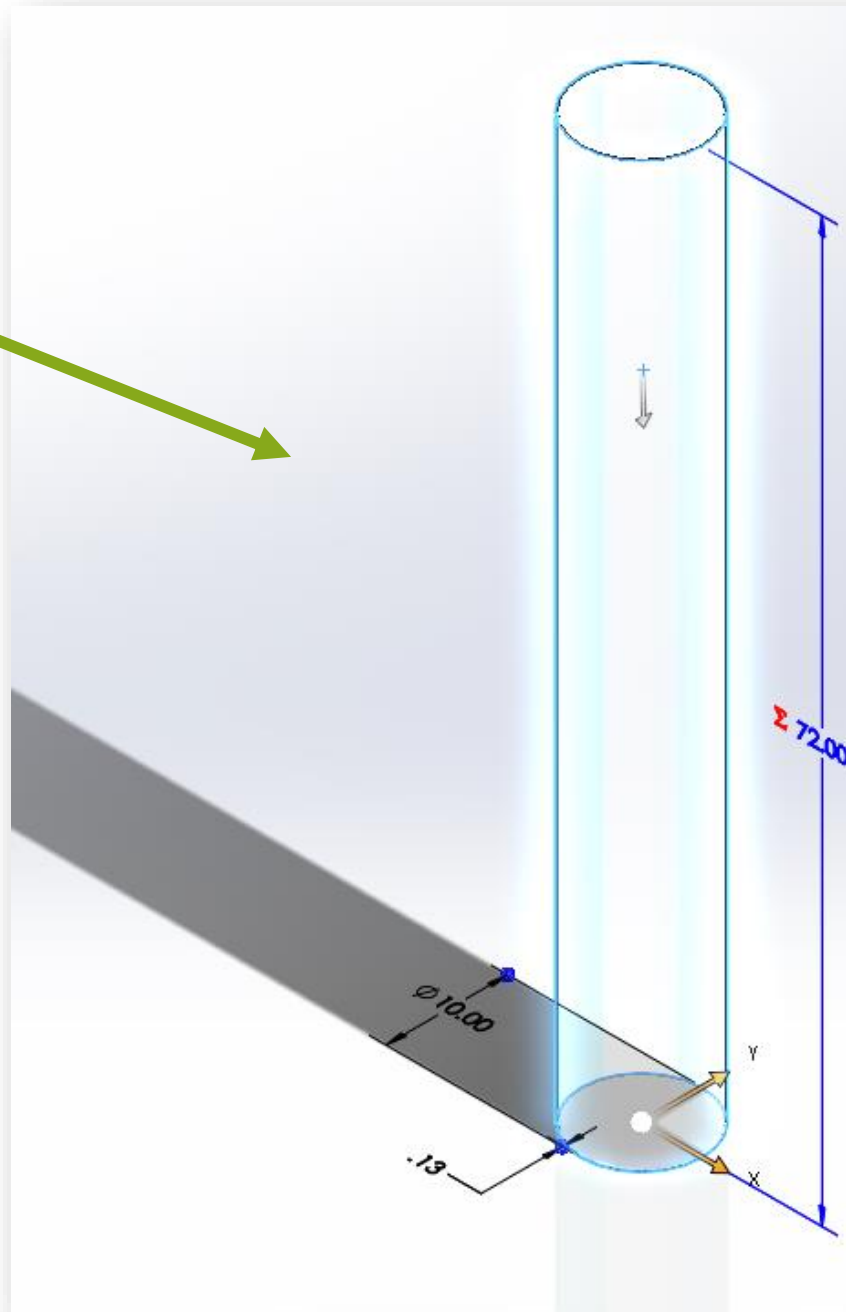


BODY



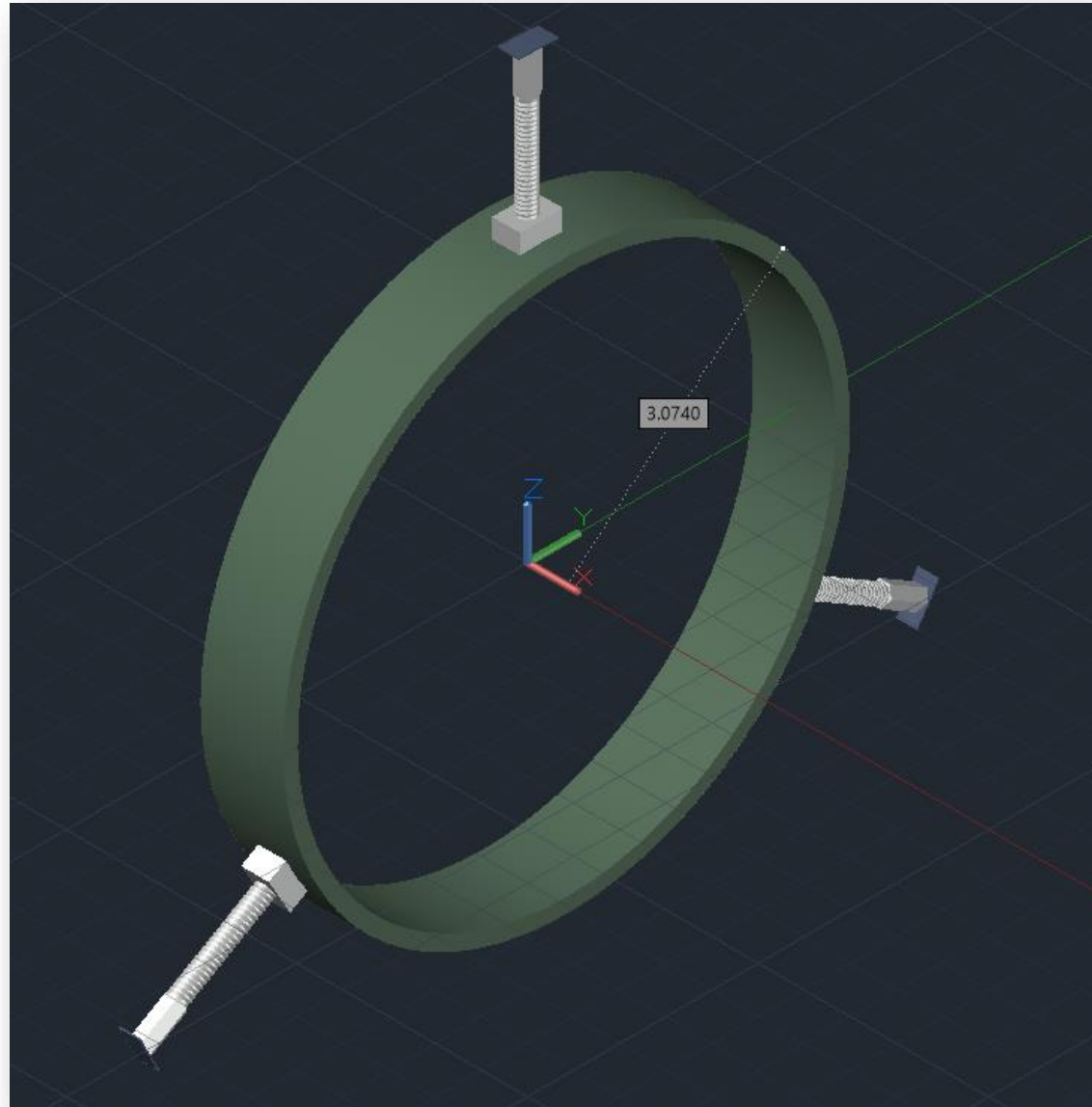
BODY

- Main Tube
 - Six Feet Long
 - Ten Inch Diameter
- Riser Tube
 - Six Feet Long
 - 6 Inch Diameter
- Water Inlet and Outlet May Come From Lid
- Water Outlet TBD
- Purchased Online

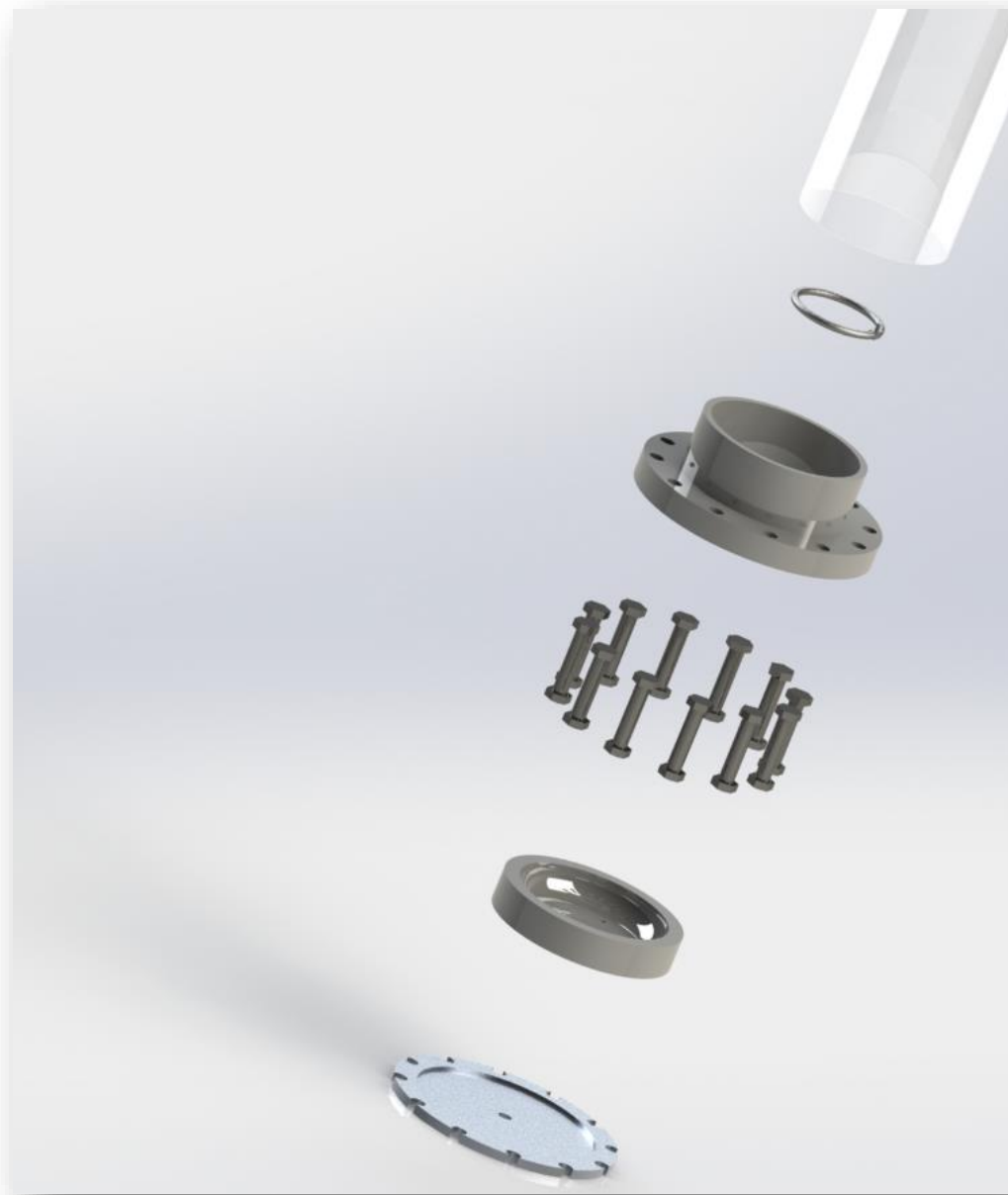


BODY

- Clamp Connectors Hold Riser Tube to Walls of the Main Tube
- Rubber Ends to Hold it to the Walls
- Threads Allow for Leveling Adjustment
- Two of them – one near top and one near bottom
- Made From Stock in Shop (?)

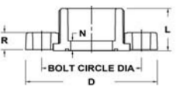


BASE

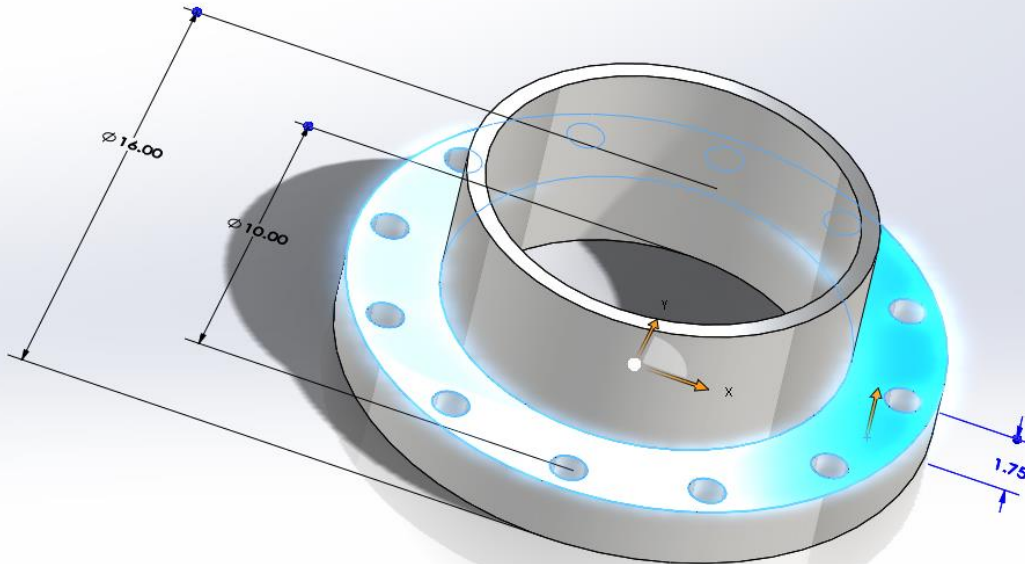


BASE

- Heavy Duty Slip on Flange to Take on Support of Reactor
- Gaskets Seal all Cracks
- Purchased Online

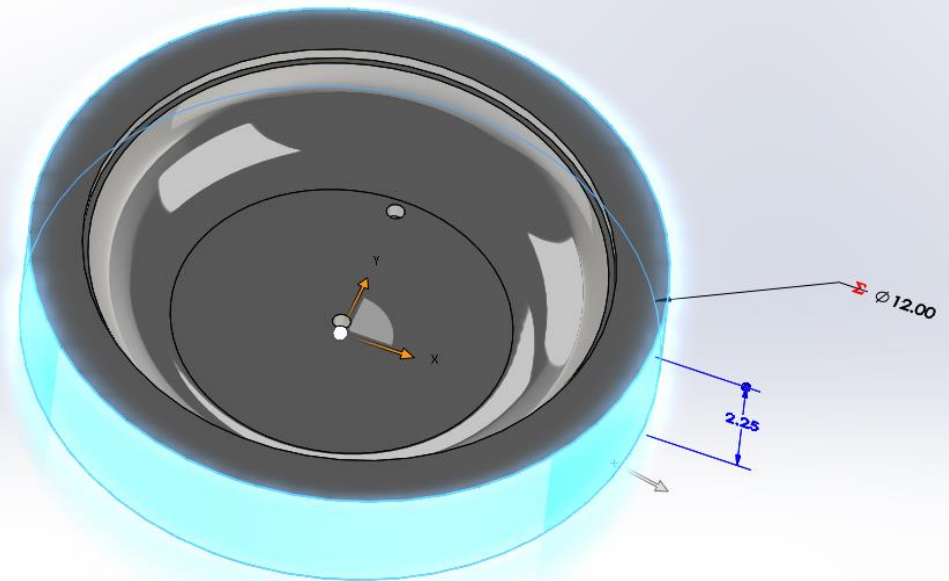
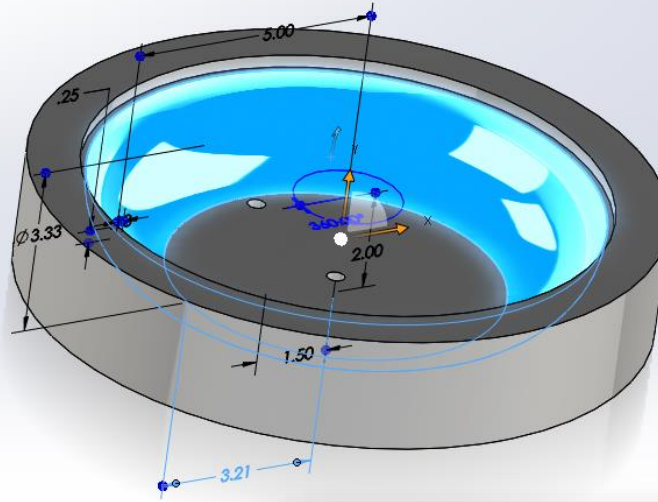


Flange (Loose Ring) -S						
Part No	Size (in)	D	L	N	R	Bolt Circle Dia.
9854-005	½	3 1/2	1 1/32	1/8	9/16	2 3/8
9854-007	¾	3 7/8	1 5/32	1/8	9/16	2 3/4
9854-010	1	4 1/4	1 3/8	1/8	11/16	3 1/8
9854-012	1¼	4 5/8	1 7/16	1/8	11/16	3 1/2
9854-015	1½	5	1 19/32	1/8	3/4	3 7/8
9854-020	2	6	1 3/4	3/16	13/16	4 3/4
9854-025	2½	7	2 1/16	3/16	1	5 1/2
9854-030FT	3	7 5/8	2 1/8	3/16	1 1/16	6
9854-040FT	4	9 3/32	2 1/2	1/4	1 1/4	7 15/32
9854-060FT	6	10 15/16	3 1/4	1/4	1 11/32	9 15/32
9854-080FT	8	13 1/2	4 9/16	5/16	1 1/2	11 3/4
9854-100FT	10	16	5 5/8	1/2	1 3/4	14 1/4
9854-120FT	12	19	6 11/16	9/16	1 3/4	17



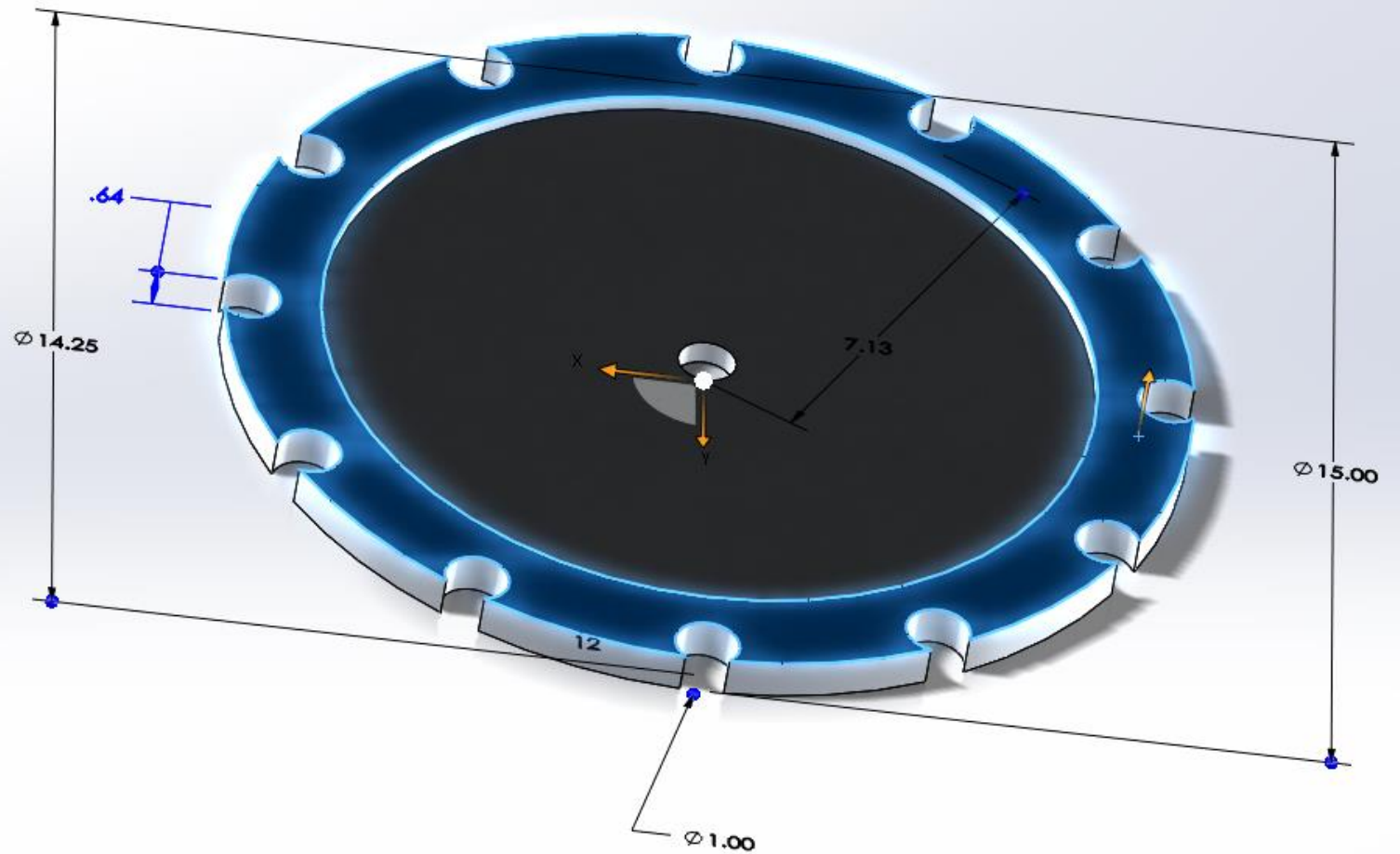
BASE

- Contoured Base to Promote Flow to Riser Tube without Dead Spots
- Drain Plug for Quick Drain
- Will Seal By Being Clamped From Top and Bottom
- Ring Cutout on Top to Center Main Tube
- Made From Stock in Shop



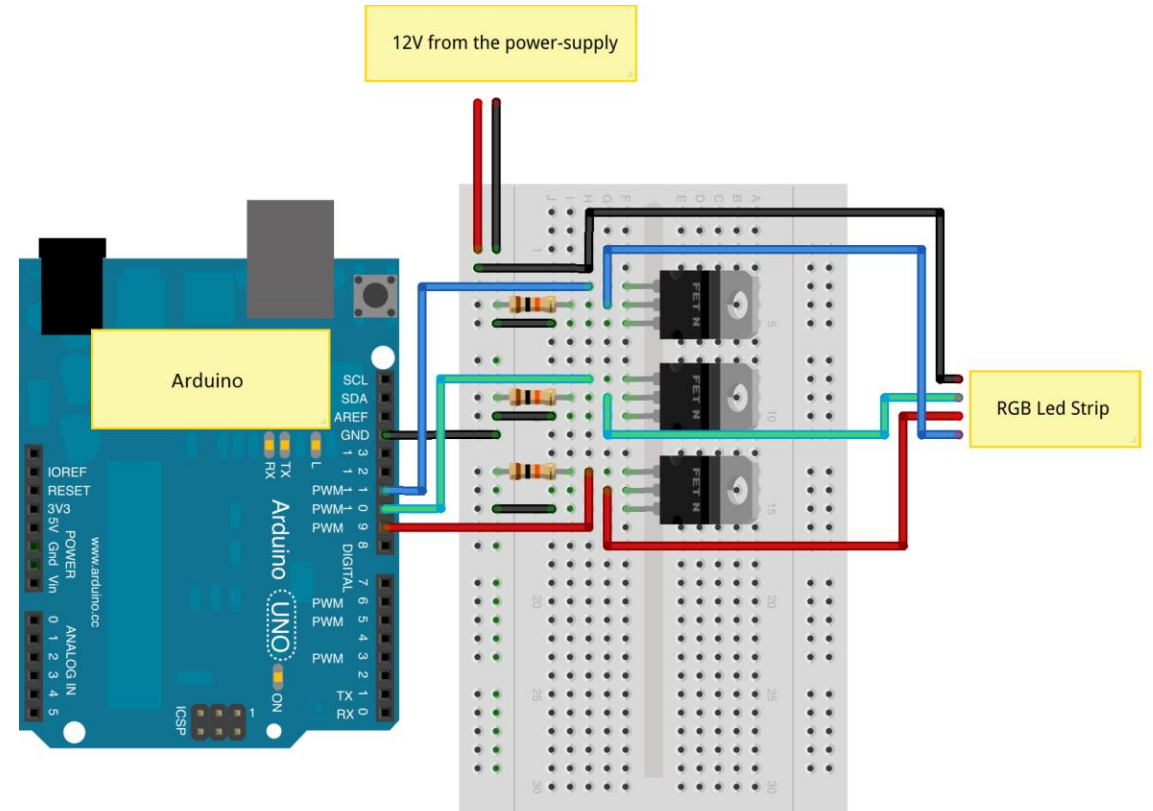
BASE

- Thick Aluminum Base Plate to Bolt Flange to and to Fix Reactor Supports to
- Support TBD
- Ring Sparger to Support Flow Which Can Be Plumbed in Through Base or Lid
- Made From Stock in Shop



5 METER 300 LED STRIP LIGHTS

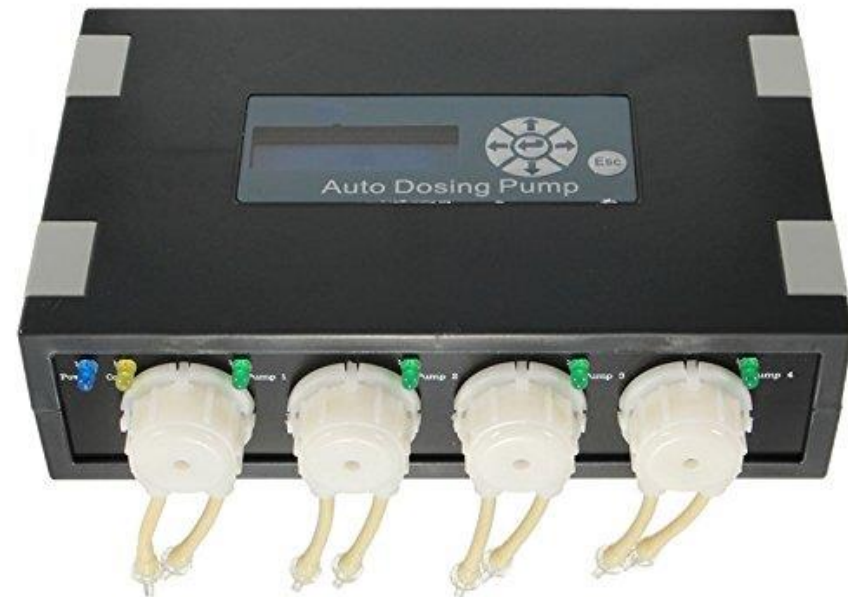
- 6 LED tubes
- 6 sets of 5 Meter Lights \$83.97
- Lights tubes will be wired in pairs sharing a power supply
- 3 pairs in total
- Controlled by Arduino
 - Pulse width modulation
- GFCI power strip for safety \$28.94



INSTRUMENTATION

JEBAO PROGRAMABLE AUTO DOSING PUMP DP-4

- \$63.00
- 4 channel dosing pump
- Q max (L/m): 70
- Dimensions: 9.25" x 5.11" x 2.55"
- Each pump can be individually programmed
- Pump 1: Water input
- Pump 2: Nutrient input
- Pump 3: Product removal
- Removes the need for daily mixing



PH SENSOR (2)

- $\$72.00 * 2 = \160.00
- pH measurement range of 0 – 14
- Withstands temperatures of 1°C - 99°C
- Single junction for general-purpose applications, epoxy body for impact resistance and durability
- Speed of response: 95% in 1 second
- Probe size: ½" x ½" x 6"
- Cable length 1 m



TEMPERATURE SENSOR

- \$11.99
- DS18B20 temperature sensor ship pin is separated by a shrinkable tube to prevent short circuits
- Stainless steel tube encapsulation makes it waterproof and prevents rust
- Temperature range of -55°C - 125°C



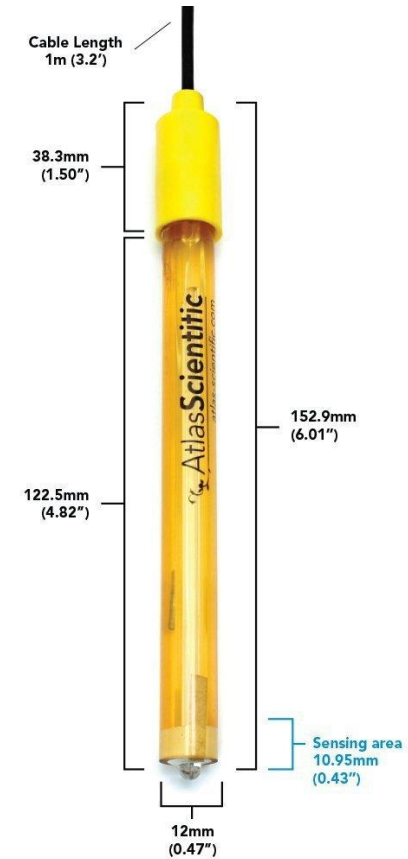
MICRO BUBBLE AIR DIFFUSER RING

- \$20.62
- 6" diameter
- Listed dimensions: 8" x 8" x 2"
- ¼" inlet fitting
- 3 suction cups
- Made from a rubber polymer
-



ORP SENSOR

- \$108.00
- Can be fully submerged indefinitely
- Range of Measurement: +/-2000mV
- Speed of Response: 95% in 1 second
- ORP electrodes, also known as redox electrodes, measure the ability of aqueous solutions to act as oxidizing or reducing agents, and they are commonly used in for water testing and food processing applications.
- Dimensions: 6" x 0.5" x 0.5"



BUDGET

GANTT CHART

PLANS FOR TESTING

PLANS FOR TESTING

- Water Velocity
 - Test water velocity compared to gas outlet pressure
 - Use neutrally buoyant beads to time flow speed
- Mixing
 - Drop in dye and check how well it disperses.

QUESTIONS?